



Electric Power Systems Workshop

Finding Speed Using Audio

What is the Doppler shift and how do we use it?

The Doppler shift is the change in pitch of the sound coming from an object when it is coming towards you versus away from you. This shift can be visually analyzed using a program called *WaveosScope*, which will then tell you the speed based on the shift in frequency and the air temperature at the time of recording.

General procedure for analyzing Doppler shift:

- Fly a low, straight pass at constant throttle setting, and record the pass. The sound recording device should be stationary.
- Download the file to your computer and convert it to a **.wav** file.
- Open this .wav file with *WaveosScope*, and find the speed (see below for details).

kmh = mph
100.0 = 62.137
110.0 = 68.351
120.0 = 74.565
130.0 = 80.778
140.0 = 86.992
150.0 = 93.206
160.0 = 99.419
170.0 = 105.633
180.0 = 111.847
190.0 = 118.061
200.0 = 124.274

Recording and Converting:

- Fly straight and level, with a constant throttle. Record roughly 1 second coming and 1 second going. Varying the throttle, altitude, or flying a curved path will make the Doppler shift more difficult to read and will introduce error.
- Use a program to convert the video to audio, such as Prism Video File Converter.

Using WaveosScope:

-To download the program go to

www.sprut.de/electronic/soft/scope.htm

-The download includes a good English manual, so you can look there for more detail on how to

use the program. To get the speed, simply open the short (2 second-ish) wave file of the fly-by, and use the right and left mouse button to place vertical lines on each of the vertical segments of a single wave (as shown on the above right). The clearest wave farthest to the right will produce the least % error. In the top-left of the screen the speed will be displayed in km/h. Multiply this value by 0.6214 to get the speed in MPH, or refer to the table above. This method is usually around 10% accurate, and it will be even easier to read (and more accurate) with a higher-pitch motor such as an EDF and with less background noise.

Geschwindigkeit: 136.89 km/h (+ 3.46 km/h)

